

BEYOND

SMART CITIES

LIGHTING SYSTEMS - CEM REFRESHER

ONLINE TRAINING COURSE

KRISHNAJI PAWAR, LEED AP BD+C, GSAS CGP, ISO 14001:2015, GCP

ENERGY SPECIALIST CURRICULUM

LIGHTING SIMULATION SOCIETY

BEYOND SMART CITIES



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LIGHTING CONTROL TECHNOLOGIES

FOR ENERGY PROFESSIONALS

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WHAT SHOULD YOU LEARN

Lighting control technologies

LIGHTING SIMULATION SOCIETY

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LIGHTING CONTROL TECHNOLOGIES



On/off snap switch
Timers and control systems
Solid-state dimmers
Dimming electronic ballasts
Occupancy sensors
Daylighting level sensors



ENERGY SAVINGS POTENTIAL WITH OCCUPANCY SENSORS

<u>Application</u>	<u>Energy Savings</u>
Offices (Private)	25-50%
Offices (Open Spaces)	20-25%
Rest Rooms	30-75%
Corridors	30-40%
Storage Areas	45-65%
Meeting Rooms	45-65%
Conference Rooms	45-65%
Warehouses	50-75%



CEM EXAM REVIEW QUESTIONS

- The efficacy of a light source refers to the color rendering index of the lamp.
A) True B) False
- Increasing the coefficient of utilization of fixtures in a room will in many instances increase the number of lamps required.
A) True B) False
- Which HID lamp has the highest efficacy – for the same wattage?
A) Mercury vapor
B) Metal halide
C) High pressure sodium
- One disadvantage to metal halide lamps is a pronounced tendency to shift colors as the lamp ages.
A) True B) False



CEM EXAM REVIEW QUESTIONS

5. A 25,000 square metre high bay facility is presently lit with 800 twin 400 watt mercury vapor fixtures (455 watts per lamp including ballast). What are the annual savings of replacing the existing lighting system with 800 single 400-watt high-pressure sodium fixtures (465 watts per lamp Including ballast)? Assume 8000 hours operation per year, an energy cost of \$0.05 per kWh, and a demand cost of \$6.00 per kW-month.



CEM EXAM REVIEW QUESTIONS

$$\Delta kW = (800 \text{ fixtures})(.455 \text{ kW/lamp})(2 \text{ lamps}) - (800 \text{ fixtures})(.465 \text{ kW/fixture}) = 356 \text{ kW}$$

$$\text{Demand \$ savings} = (356 \text{ kW})(\$6/\text{kW-mo})(12 \text{ mo/yr}) = \$25,632/\text{yr}$$

$$\text{Energy \$ savings} = (356 \text{ kW})(8000 \text{ hrs/yr})(\$0.05/\text{kWh}) = \$142,400/\text{yr}$$

$$\text{Total \$ savings} = (\$25,632 + \$142,400)/\text{yr} = \$168,032/\text{yr}$$

$$\text{Cost} = (800 \text{ fixtures})(\$400/\text{fixture}) = \$320,000 ??$$



7. THE LIGHT SWITCH PROBLEM (JUST FOR FUN)

You must determine which switch on a three switch panel on the first floor of a building controls a light on the fifth floor of the building.

- › The other two switches are not connected to anything and there is no way to see any light from the fifth floor without going up stairs.
- › You have no tools and you cannot take the switch cover off.
- › You can only make one trip up the stairs to the light. How can you determine which switch operates the light?



SOLUTION

- › Turn on the middle switch and the right-hand switch, wait 10 minutes.
- › Turn the middle one off and run up the stairs. If the light bulb is off and cold it is the left-hand switch. If the bulb is off and hot it is middle switch. If the bulb is on it is the right-hand switch.



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MARKETPLACE